

工程热物理

涂层表面上湿热空气对流冷凝传热的实验研究

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摘要:

采用加湿热空气模拟燃气锅炉的尾部烟气, 通过热管换热器进行对流冷凝传热实验研究; 并利用十八烷基硫醇形成的分子自组装膜对热管表面进行改性, 从而强化冷凝传热。实验在较大的加湿热空气温度(70~120 ℃)和水蒸气体积分数(0%~20%)范围内进行, 主要研究了对流冷凝传热的影响因素和分子自组装膜的强化效果。实验结果表明: 水蒸气体积分数、加湿热空气的质量流量和入口温度是影响对流冷凝传热的主要因素, 拥有分子自组装膜的改性表面对冷凝传热有极好的强化作用。

关键词: 热管换热器 加湿热空气 对流冷凝传热 分子自组装膜

Experimental Investigation on Coating Surface on the Convection-condensation Heat Transfer of Hot Humidity Air

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Abstract:

A modified surface of heat pipe was prepared with n-octadecyl mercaptan self-assembled monolayers (SAMs). In order to investigate the characteristics of convection-condensation heat transfer of the heat pipe heat exchanger and heat transfer enhancement after modification, vapor-air mixture generated by a boiler was used to simulate the flue gas experimentally. The experiment focused on factors that may affect the performance of the convection- condensation heat transfer and the efficiency of heat transfer enhancement in the presence of SAMs. The experiment was conducted under the condition of temperature ranged from 70 ℃ to 120 ℃ and of vapor volume fraction ranged from 0 to 20%. The results are shown below: the vapor volume fraction, the mass flow rate and the inlet temperature of the vapor-air mixture are the main factors that influence the performance of the convection-condensation heat transfer; the surface of heat pipe modified with SAMs has a great effect on the enhancement of heat transfer.

Keywords: heat pipe heat exchanger hot air with high moisture convection-condensation heat transfer self-assembled monolayers (SAMs)

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